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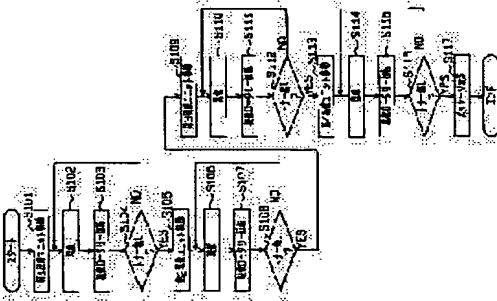
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(54) IMAGE FORMING APPARATUS AND IMAGE FORMING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image forming apparatus and an image forming method which enable development based on monochromatic toner in a large quantity without changing the designs of a development unit and a development unit support, prolongation of a time period to consume the toner during the development of the development unit, of the replacement of the development unit.
SOLUTION: Four development units are mounted on a development rotary, and the black toner is housed in all development units. Then, a CPU successively moves an adjacent development unit in a development position as soon as toner is consumed.



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CLAIMS

[Claim(s)]

[Claim 1] The electrostatic latent-image support which supports an electrostatic latent image to a peripheral surface, and the development unit which holds a toner and develops said electrostatic latent image with the toner concerned, Actuation of the development unit supporter which can two or more hold said development unit, and said development unit supporter is controlled. In image formation equipment equipped with the control means of the development unit supporter which changes alternatively the development unit used for development out of two or more development units It has a discernment means to identify the color information on the toner held in the development unit at least. A development unit supporter The development unit of at least two bodies which held the toner of the same color can be held. Said control means is image formation equipment characterized by controlling actuation of a development unit supporter in order to develop monochrome using the development unit of at least two bodies which identified the development unit of the same color based on the color information identified by said discernment means, and held the toner of the same color.

[Claim 2] Said development unit is image formation equipment according to claim 1 characterized by having a storage means to memorize color information and identifying said color information with said discernment means.

[Claim 3] Said development unit supporter is image formation equipment according to claim 1 or 2 which is the body of revolution which changes alternatively the development unit used for development by the rotation drive, is made to carry out the rotation drive of the development unit supporter concerned by said control means, and is characterized by moving any one in two or more development units to the location where said electrostatic latent-image support counters.

[Claim 4] Image formation equipment given in any 1 term of claim 1 characterized by changing to another development unit which controlled actuation of a development unit supporter by predetermined timing by said control means, and held the toner currently used for the development concerned, and the toner of the same color into the development by the monochromatic toner - claim 3.

[Claim 5] It is image formation equipment according to claim 4 characterized by setting up said predetermined timing when the number of printing pages reaches a predetermined value when the development by the monochromatic toner continues.

[Claim 6] Said development unit is image formation equipment according to claim 4 characterized by setting up when it has a storage means to memorize the consumption of a toner and the consumption of said toner reaches a predetermined value in said predetermined timing.

[Claim 7] The color information on the toner held in two or more development units held at the development unit supporter is identified with a discernment means. It is, the image formation approach by the image formation equipment which develops negatives by changing alternatively the development unit used for development by the control means of a development unit supporter out of two or more development units -- The process which identifies the color information on the toner held in said development unit with a discernment means. The image

formation approach characterized by consisting of a process which controls actuation of a development unit supporter by the control means in order to develop monochrome using the development unit of at least two bodies which identified the development unit of the same color based on said color information, and held the toner of the same color.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the image formation equipment and the image formation approaches of forming an image using electrophotographic technology, such as a color printer and facsimile.

[0002]

[Description of the Prior Art] Generally, the image formation equipment (color printer) using electrophotographic technology is equipped with the photo conductor, an electrification means to electrify the peripheral face of the photo conductor, the exposure unit that exposes the peripheral face of a photo conductor alternatively and forms an electrostatic latent image, and the development unit which develops said electrostatic latent image in a toner image. Moreover, the image formation equipment is equipped with the imprint unit which makes the candidate for an imprint in said toner image. The development rotary as a development unit supporter held pivotally nothing in approximate circle tubed is installed in the adjoining location of a photo conductor, and the development rotary is formed removable in the development unit of four colors (Yellow Y, MAZENDAM, Cyanogen C, black K).

[0003]

[Problem(s) to be Solved by the Invention] However, since it is equipped with the development unit of four bodies in the image formation equipment of a configuration conventionally [above-mentioned] in order to form a color picture, the magnitude of each development unit becomes smaller than the magnitude of the development unit of one body in the image formation equipment for mono-colors. Therefore, if the development of a lot of monochrome, i.e., printing, is performed using the toner of the development unit of one body in the image formation equipment for color picture formation, the time amount whose toner is lost as compared with the case where the image formation equipment for mono-colors is used will become early.

[0004] Furthermore, the amount of toners of the development unit of four bodies held is also almost the same. Therefore, when mono-color printing which used the toner of the development unit of one body is performed, the lost time amount becomes early as compared with other toners. Therefore, the development unit of the toner used for mono-color printing needed to be exchanged repeatedly, the toner needed to be supplied, and there was a problem that the exchange was very troublesome.

[0005] Moreover, the development unit used for mono-color printing was formed more greatly than the development unit of other colors, and it was possible to make [many] toner capacity. However, while there is a limitation in the size which can enlarge a development unit, in order to enable wearing of the development unit from which magnitude, i.e., a configuration, differs with the location which equips with the internal structure and development unit of a color printer in that case, the design change of the configuration of a development rotary had to be carried out, and there was also a problem that a manufacturing cost increased.

[0006] This invention is made paying attention to the trouble which exists in such a conventional technique. The place made into the purpose is to offer the image formation equipment and the image formation approach of being able to perform development by the monochromatic toner in

large quantities, without carrying out the design change of a development unit and the development unit supporter, being able to make late time amount whose toner is lost in case it is the development, and reducing the count of exchange of a development unit.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image formation equipment of invention according to claim 1 The electrostatic latent-image support unit which supports an electrostatic latent image to a peripheral surface, and the development unit which holds a toner and develops said electrostatic latent image with the toner concerned, Actuation of the development unit supporter which can two or more hold said development unit, and said development unit supporter is controlled. In image formation equipment equipped with the control means of the development unit supporter which changes alternatively the development unit used for development out of two or more development units It has a discernment means to identify the color information on the toner held in the development unit at least. A development unit supporter The development unit of at least two bodies which held the toner of the same color can be held. It is characterized by said control means controlling the actuation of a development unit supporter so that it may develop monochrome using the development unit of at least two bodies which identified the development unit of the same color based on the color information identified by said discernment means, and held the toner of the same color.

[0008] The image formation equipment of invention according to claim 2 is characterized by equipping said development unit with a storage means to memorize color information, and identifying said color information with said discernment means in invention according to claim 1. [0009] In invention according to claim 1 or 2, said development unit supporter is body of revolution which changes alternatively the development unit used for development by the rotation drive, and the image formation equipment of invention according to claim 3 carries out the rotation drive of the development unit supporter concerned by said control means, and is characterized by to move any one in two or more development units to the location where said electrostatic latent-image support counters.

[0010] In invention given in any 1 term of claim 1 - claim 3, the image formation equipment of invention according to claim 4 controls actuation of a development unit supporter by predetermined timing by said control means, and is characterized by changing to another development unit which held the toner currently used for the development concerned, and the toner of the same color into the development by the monochromatic toner.

[0011] In invention according to claim 4, the image formation equipment of invention according to claim 5 is characterized by setting up said predetermined timing, when the number of printing pages reaches a predetermined value, in case the development by the monochromatic toner continues.

[0012] The image formation equipment of invention according to claim 6 is characterized by having equipped said development unit with a storage means to memorize the consumption of a toner, and setting up said predetermined timing, when the consumption of said toner reaches a predetermined value in invention according to claim 4.

[0013] The image formation approach of invention according to claim 7 identifies the color information on the toner held in two or more development units held at the development unit supporter with a discernment means. It is, the image formation approach by the image formation equipment which develops negatives by changing alternatively the development unit used for development by the control means of a development unit supporter out of two or more development units -- The process which identifies the color information on the toner held in said development unit with a discernment means, The development unit of the same color is identified based on said color information, and it is characterized by consisting of a process which controls actuation of a development unit supporter by the control means in order to develop monochrome using the development unit of at least two bodies which held the toner of the same color.

[0014]

[Embodiment of the Invention] (The 1st operation gestalt) The 1st operation gestalt which materialized this invention to image formation equipment (color printer) is hereafter explained

according to a drawing. Drawing 1 is the schematic diagram showing the inside of image formation equipment 10 typically. In addition, this 1st operation gestalt takes shape and explains, printing by the toner, i.e., monochrome printing, of the monochrome which used the toner of the black held in the development unit 23 (231-234) of four bodies.

[0015] First, the outline in image formation equipment 10 is explained. As shown in drawing 1, in image formation equipment 10, the photo conductor 17 as electrostatic latent-image support which supports an electrostatic latent image to a peripheral surface, and a toner are held, and the development rotary 22 as a development unit supporter which can two or more hold the development unit 23 which develops said electrostatic latent image with the toner concerned, and said development unit 23 is formed. Moreover, the control unit 14 which controls the image formation equipment 10 whole shown in the exposure unit 21, the middle imprint unit 12, the fixing unit 13, feed equipment 16, and drawing 3 is formed.

[0016] As shown in drawing 1, as for said photo conductor 17, the electrification machine 19 which electrifies a peripheral face uniformly in slide contact with the peripheral face of a photo conductor 17 in nothing and the adjoining location of the photo conductor 17 is installed in the shape of a drum. And if the alternative exposure according to desired image information is made by said exposure unit 21 at the sensitization layer (not shown) of a photo conductor 17 after the peripheral face of a photo conductor 17 is charged with the electrification vessel 19, the electrostatic latent image according to said image information will be formed in the sensitization layer.

[0017] Said development rotary 22 is arranged possible [a rotation drive], and is constituted by the adjoining location of a photo conductor 17 possible [maintenance of the development unit 23 (on these specifications, the 1st 2nd, 3rd, and 4th development unit 231,232,233,234 is called hereafter) of four bodies]. Moreover, the location of the development unit 23 held is established in a respectively identifiable identification-of-position means (not shown), and the identification-of-position means is constituted by the development rotary 22 possible [an output] in positional information to the control unit 14.

[0018] As shown in drawing 2, each development units 231-234 were formed in the same configuration, respectively, and are equipped with case 23a which can hold a toner. Moreover, case 23a is equipped with developing-roller 23b supported by this case 23a pivotable and feed roller 23c which supplies said toner to the front face of developing-roller 23b by carrying out a pressure welding to said developing-roller 23b while being supported by case 23a pivotable.

Furthermore, 23d of dashboards is formed in case 23a, and the inside of case 23a is divided into the feed roller 23c and back side in case 23a by 23d of the dashboard. And the toner of black is held in each development units 231-234, respectively.

[0019] Moreover, as shown in drawing 3, nonvolatile memory 23a (drawing 3 shows memory) which becomes each development units 231-234 from ROM, respectively is prepared as a color information storage means and a consumption storage means of a toner, and the identification information which makes identifiable each development units 231-234, such as color information on the toner held by each nonvolatile memory 23a in case 23a, respectively, consumption information, and the date of manufacture, according to an individual, respectively is memorized. [0020] In addition, as shown in drawing 1, the development side connector 24 is formed in each development units 231-234, respectively, and said nonvolatile memory 23a is connected to these development side connector 24, respectively. On the other hand, in the near location of the development rotary 22, said development side connector 24 and connection are possible, and the control side connector 25 constituted movable in between the connecting location and connectionless locations is formed.

[0021] The rotation drive of the development rotary 22 is carried out with a control unit 14 so that the development units 231-234 of four bodies may serve as a location which can connect the development side connector 24 of either of each development units 231-234, and said control side connector 25 in maintenance and the condition of specifically having been equipped, on the development rotary 22. And the identification information which both the connectors 24 and 25 are connected and includes the color information on nonvolatile memory 23a is read, and the identification information of the development units 231-234 of four bodies is memorized by

the control unit 14. Furthermore, the color information on the development units 231-234 in the development rotary 22 and the positional information discriminated from said identification-of-position means are associated, and it is memorized by the control unit 14 whether the location of development rotary 22 throat is equipped with the development units 231-234 of which color.

[0022] Moreover, in said wearing condition, developing-roller of any one body 23b is arranged among each development units 231-234 in the location (development location) where a photo conductor 17 counters by carrying out the roll control of the development rotary 22 with a control unit 14. The toner wear electrification was carried out [the toner] by rotation of feed roller 23c in this development location is supplied to the developing-roller 23b side, and that toner is transported to the sensitization layer of a photo conductor 17, after having been supported by the front face of developing-roller 23b. Then, the electrostatic latent image on a photo conductor 17 is developed with a toner (toner image), and it develops it.

[0023] Furthermore, after being in the feed roller 23c side in case 23a of each development units 231-234 and being used in the case of development, the collected electrification toner is discharged from the feed roller 23c side in connection with the roll control of the development rotary 22 to the method of the back in case 23a. Continuously, by the roll control of the development rotary 22, mixed stirring is carried out with an intact toner, homogeneity distributes and both toners are refreshed for an electrification toner. And the toner refreshed when again located in a development location is supplied to the feed roller 23c side.

[0024] As shown in drawing 1, said middle imprint unit 12 arranged in the upper part location of a photo conductor 17 consists of the middle imprint belts 30 and cleaning means (not shown) of the shape of endless [which was laid between a driving roller 29, the primary imprint support roller 27, a tension roller 28, the cleaner backup roller 26, and each / roller 26-29]. Said photo conductor 17 is arranged in the opposite location through the middle imprint belt 30 of said primary imprint support roller 27, and the secondary imprint roller 31 is arranged in the opposite location which sandwiched the middle imprint belt 30 of a driving roller 29.

[0025] the gearing (not shown) with which said driving roller 29 was fixed to the edge meshes with the gearing for a drive of the drive motor of said photo conductor 17 (not shown) -- a photo conductor 17 and abbreviation -- it consists of same peripheral speed possible [a rotation drive]. That is, the circulation drive of the middle imprint belt 30 is carried out with the peripheral speed of a photo conductor 17 and abbreviation identities.

[0026] And the toner image formed on the photo conductor 17 in the pressure-welding section of said primary imprint support roller 27 and photo conductor 17 in the process in which the circulation drive of the middle imprint belt 30 is carried out is imprinted by the middle imprint belt 30. Furthermore, the toner image imprinted by the middle imprint belt 30 is imprinted by the record media 32, such as a form supplied from said feed equipment 16, in the pressure-welding section of the secondary imprint roller 31 and a driving roller 29. Said fixing unit 13 installed in the location which adjoins the middle imprint unit 12 consists of a fixing roller 33 which has a heat source, and a pressurization roller 34 by which the pressure welding is carried out to this fixing roller 33.

[0027] After the fixing unit 13 is finally fixed to the toner image imprinted by the record medium 32 on a record medium 32, the record medium 32 is discharged out of a color printer. In addition, the cleaning machine 20 installed in the adjoining location of a photo conductor 17 removes the toner which remains to a photo conductor 17.

[0028] Subsequently, if the control unit 14 which controls the above-mentioned image formation equipment 10 is explained, as shown in drawing 3, a control unit 14 consists of the controller section 38 and an engine control section 35, and both are connected through the interface line. Said controller section 38 performs the communication link with a host computer 36, and various information, such as image information produced by the application software of a personal computer (not shown) etc., is sent to the controller section 38 from a host computer 36. Said controller section 38 has the function to change into the image data of yellow, MAZENDA, cyanogen, and black the red as an image information signal sent from the host computer 36. Green, and blue RGB data. Furthermore, it has the function to save image data in the memory (not shown) of the controller section 38. In addition, in this operation gestalt, in order to perform

monochrome printing, said RGB data are changed into the image data of black.

[0029] Said engine control section 35 was equipped with CPU40 as a discernment means and a control means, in addition is equipped with RAM41, ROM42, the I/O-hardware-control section 43, A/D converter 44, D/A converter 45, and the body memory 46 grade. Said CPU40 identifies the color information and consumption information on a toner in the development units 231-234 while controlling each part which constitutes image formation equipment 10. And if it judges that the consumption of a toner reached the specified quantity, the rotation drive of the development rotary 22 will be controlled by predetermined timing. Moreover, if it judges that the amount of the toner used converted into printing to the record medium 32 of predetermined size at the complement, and reached a part for a predetermined page, the rotation drive of the development rotary 22 will be controlled.

[0030] Moreover, when the development side connector 24 of either of each development units 231-234 and said control side connector 25 are connected, nonvolatile memory 23e and the communication link of CPU40 are attained, and identification information new to nonvolatile memory 23e possible [reading of the identification information of nonvolatile memory 23e] is constituted possible [writing]. Furthermore, CPU40 associates said identification information and the positional information in the development rotary 22 of each development units 231-234, and it identifies which location is equipped with the development units 231-234 of which color. [0031] And CPU40 performs control which rotates the development rotary 22 so that it may locate the development units 231-234 which identified the location and color of the development units 231-234 of the development rotary 22, and held the toner of the specified color to a development location. Especially CPU40 performs control changed to another development unit 23 which held the toner currently used for the development concerned to predetermined timing, and the toner of the same color into the development by the monochromatic toner.

[0032] Said RAM41 memorizes temporarily the various information about image formation equipment 10. Moreover, said ROM42 memorizes the various programs for controlling image formation equipment 10, and the I/O-hardware-control section 43 controls a I / O data. Said A/D converter 44 changes the analog signal in image formation equipment 10 into a digital signal, and D/A converter 45 changes a digital signal into an analog signal. Said body memory 46 stores various identification information and positional information, such as existence information on the development units 231-234 in said development rotary 22, toner color information written in nonvolatile memory 23e, and toner consumption information. And it is memorized whether it is equipped with the development units 231-234 which held the toner of which color in the location of development rotary 22 throat by identification information and positional information.

[0033] Subsequently, in order to perform monochrome printing by the image formation equipment 10 of the above-mentioned configuration, it explains using the flow chart which shows the actuation which develops negatives using the development units 231-234 (it considers as the 1st development unit 231, the 2nd development unit 232, the 3rd development unit 233, and the 4th development unit 234 in addition) of four bodies to drawing 4. In addition, this actuation is performed by control of CPU40 based on the program memorized by ROM42. Moreover, the identification information of a purport in which the toner of black is held, respectively is stored in nonvolatile memory 23e of each development units 231-234.

[0034] And while each development units 231-234 and CPU40 communicate before development actuation and the owner information on the development units 231-234 of four bodies and the identification information of each development units 231-234 are stored in the body memory 46, it is memorized which location is equipped with which development units 231-234.

[0035] Now, after the printing command signal (image information signal) from a host computer 36 is changed into the image data of black in the controller section 38, and being saved in the memory of the controller section 38 and completing conversion of the image data of the specified quantity, the information on a purport that development initiation is required is transmitted to the engine control section 35. Then, an electrostatic latent image is formed of the electrification machine 19 and the exposure unit 21.

[0036] Continuously, the rotation drive of the development rotary 22 is carried out, and the 1st development unit 231 is moved to a development location [step 101 (S101) is only called

hereafter). Subsequently, development of said electrostatic latent image is performed using the toner in the 1st development unit 231 (S102). Next, the consumption of the toner in the 1st development unit 231 is judged to have reached the amount of toners which can be held in the feed roller 23c side from 23d of dashboards of case 23a. Then, while 360 rotation drives of the development rotary 22 are controlled (S103) and stirring of the toner in the 1st development unit 231 is performed, the toner which exists in the back in case 23a is supplied to the feed roller 23c side.

[0037] And the consumption of the toner after rotation of the development rotary 22 and in the 1st development unit 231 is read, and the existence of a toner is distinguished (S104). If toner consumption does not reach the amount of toners held in the 1st development unit 231, but a toner is in the 1st development unit 231 and it will be distinguished (it is NO at S104), development will be continuously performed using the toner of the 1st development unit 231.

[0038] If toner consumption reaches the amount of toners held in the 1st development unit 231, there is almost no toner into the 1st development unit 231 and it will be distinguished (it is YES at S104), the rotation drive of the development rotary 22 will be carried out 90 degrees, the 2nd development unit 232 will be moved to a development location (S105), and it will change to another 2nd development unit 232 which held the toner of black. Subsequently, development of an electrostatic latent image is performed using the toner of the 2nd development unit 232 (S106).

[0039] And stirring of the toner in the 2nd development unit 232 and supply are henceforth performed by 360 rotation drives of the development rotary 22 like the time of the 1st development unit 231 (S107). If the existence of a toner is distinguished after rotation of the development rotary 22 (S108), and a toner is in the 2nd development unit 232 and it will be distinguished (it is NO at S108), development will be continuously performed using the toner of the 2nd development unit 232. On the other hand, if there is no toner into the 2nd development unit 232 and it will be distinguished (it is YES at S108), the rotation drive of the development rotary 22 will be carried out 90 degrees, and the 3rd development unit 233 will be moved to a development location (S109). And development is performed using the toner of the 3rd development unit 233 (S110).

[0040] Continuously, stirring of the toner in the 3rd development unit 233 and supply are performed by 360 rotation drives of the development rotary 22 (S111). If the existence of a toner is distinguished after rotation of the development rotary 22 (S112), and a toner is in the 3rd development unit 233 and it will be distinguished (it is NO at S112), development will be continuously performed using the toner of the 3rd development unit 233. On the other hand, if there is no toner into the 3rd development unit 233 and it will be distinguished (it is YES at S112), the rotation drive of the development rotary 22 will be carried out 90 degrees, and the 4th development unit 234 will be moved to a development location (S113).

[0041] Furthermore, development is performed using the toner of the 4th development unit 234 (S114). And stirring of the toner in the 4th development unit 234 and supply are performed by 360 rotation drives of the development rotary 22 (S115). If the existence of a toner is distinguished after rotation of the development rotary 22 (S116), and a toner is in the 4th development unit 234 and it will be distinguished (it is NO at S116), development will be continuously performed using the toner of the 4th development unit 234. On the other hand, if there is no toner into the 4th development unit 234 and it will be distinguished (it is YES at S116), the message of the purport which shows that there is no toner in the display (not shown) of image formation equipment 10 will display --- having (S117) --- it is ended, monochromatic the development by the toner, i.e., printing processing.

[0042] The effectiveness demonstrated according to said 1st operation gestalt is indicated below.

(1) CPU40 is identifying being equipped with the development units 231-234 which held the toner of black in all the locations of the development rotary 22. Therefore, when identifying that CPU40 of the toner of the black of the development unit 23 of one body was lost, the location of the development unit 23 which held the toner of the same color was identified, and the development unit 23 in an adjoining location was moved to the development location. Therefore,

as soon as a toner is lost, monochrome can be developed using the toner of the development units 231-234 which carry out sequential contiguity. Therefore, while being able to make late time amount whose toner secures the amount of toners in large quantities, and is lost unlike the former which performed monochrome printing using the toner of the black held only in one among the development units 231-234 of four bodies and being able to decrease the count of exchange of the development units 231-234 accompanying toner supply, monochrome development, i.e., monochrome printing, can be performed in large quantities.

[0043] (2) Since the development units 231-234 which make the shape of isomorphism were used, in order to secure many capacity of a toner, the design change of the development units 231-234, the 231-234 is performed, and in order to enable wearing of the development units 231-234, the need of performing the design change of the development rotary 22 is lost. Therefore, without carrying out the design change of the conventional image formation equipment 10, monochrome development, i.e., monochrome printing, can be performed in large quantities, and the fault that a manufacturing cost increases in connection with a design change can be abolished.

[0044] (3) As soon as a toner is lost, develop negatives using the development units 231-234 which adjoin the 1st development unit 231, the 2nd development unit 232, the 3rd development unit 233, and the 4th development unit 234. Therefore, for example, it is in the location which counters, the time amount which the rotation drive of the development rotary 22 takes as compared with the case where negatives are developed using the 1st development unit 231 and the 3rd development unit 233 can be shortened, and it can raise, the development, i.e., the printing throughput, within predetermined time.

[0045] (4) The toner which is made to rotate the development rotary 22 in the middle of the development by each development units 231-234, and is in the method of the back in case 23a from 23d of dashboards was made to supply to the feed roller 23c side from 23d of dashboards. Therefore, it cannot be concerned that the consumption of a toner has not reached the specified quantity, either, but the fault that a toner is lost and development is no longer performed to the feed roller 23c side can be abolished.

[0046] (The 2nd operation gestalt) Hereafter, the 2nd operation gestalt mainly explains a different point from the above-mentioned 1st operation gestalt, and attaches and explains the same sign about the same member as the 1st operation gestalt. In the 2nd operation gestalt, the program for making said ROM42 control the rotation drive of the development rotary 22 by timing based on a predetermined decision criterion by CPU40 is memorized. It is set to whether to have converted said timing into the amount of the toner used printing to the record medium 32 of A4 size at the complement, and to have reached a part for 10 pages of continuation.

[0047] And in the 2nd operation gestalt, it explains using the flow chart which shows the actuation which develops negatives using the 1st and 2nd development unit 231,232 of two bodies with which the location which carries out phase opposite among the 1st - the 4th development units 231-234 was equipped, and performs monochrome printing by the image formation equipment 10 of the above-mentioned configuration to drawing 5. That is, the 1st and 2nd development unit 231,232 with which the location which carries out phase opposite in the development rotary 22 was equipped is identified by CPU40, and rotation of the development rotary 22 is made to control so that both the development unit 231,232 is located in a development location, respectively. Moreover, the identification information of a purport in which the toner of black is held, respectively is stored in nonvolatile memory 23e of the 1st and 2nd development unit 231,232, and the owner information on the development unit 231,232 of two bodies and the identification information of each development unit 231,232 are stored in the body memory 46.

[0048] Now, after the printing command signal (image information signal) from a host computer 36 is changed into the image data of black in the controller section 38 and predetermined processing is performed, the information on a purport that development initiation is required is transmitted to the engine control section 35. Then, an electrostatic latent image is formed of the electrification machine 19 and the exposure unit 21.

[0049] Continuously, the rotation drive of the development rotary 22 is carried out, and the 1st development unit 231 is moved to a development location (S201). Subsequently, the existence of

printing is distinguished (S202). if there is printing and it will be distinguished (it is YES at S202), the existence of the toner in the 1st development unit 231 will be distinguished (S203 --- in addition, drawing 5 shows ? with the 1st toner). On the other hand, printing processing will be ended, if printing is distinguished as it is nothing (it is NO at S202).

[0050] And in said S203, if a toner is in the 1st development unit 231 and it will be distinguished (it is YES at S203), development will be performed using the toner of the 1st development unit 231 (S204). Then, the amount of the toner used of the 1st development unit 231 is judged based on said decision criterion (S205). If it is judged that the amount of the toner used of the 1st development unit 231 has not reached a part for 10 pages of continuation (it is NO at S205), return and the existence of the printing remainder will be distinguished by said S202 (S202). If the printing remainder is distinguished as it is nothing (it is NO at S202), a development, i.e., printing processing, will be ended. If the printing remainder is distinguished from owner ** (it is YES at S202), the same processing as the above will be performed again.

[0051] Now, in said S205, if it is judged that the amount of the toner used of the 1st development unit 231 reached a part for 10 pages of continuation (it is YES at S205), the rotation drive of the development rotary 22 will be carried out 180 degrees, and the 2nd development unit 232 will be moved to a development location (S206). Subsequently, the existence of printing is distinguished (S207). if there is printing and it will be distinguished (it is YES at S207), the existence of the toner in the 2nd development unit 232 will be distinguished (S208 --- in addition, drawing 5 shows ? with the 2nd toner). On the other hand, printing processing will be ended, if printing is distinguished as it is nothing (it is NO at S207).

[0052] And in said S208, if a toner is in the 2nd development unit 232 and it will be distinguished (it is YES at S208), development will be performed using the toner of the 2nd development unit 232 (S209). Then, the amount of the toner used of the 2nd development unit 232 is judged based on said decision criterion (S210). If it is judged that the amount of the toner used of the 2nd development unit 232 has not reached a part for 10 pages of continuation (it is NO at S210), return and the existence of the printing remainder will be distinguished by said S207 (S207). Printing processing will be ended, if the printing remainder is distinguished as it is nothing (it is NO at S207). If the printing remainder is distinguished from owner ** (it is YES at S207), the same processing as the above will be performed again.

[0053] Now, in said S210, if it is judged that the amount of the toner used of the 2nd development unit 232 reached a part for 10 pages of continuation (it is YES at S210), the rotation drive of the development rotary 22 will be carried out 180 degrees, and the 1st development unit 231 will be moved to a development location (S201). And if development is performed and printing is lost while processing from S201 is again performed like the above, and a change-over with the 1st development unit 231 and the 2nd development unit 232 is performed until the printing remainder is lost, a development, i.e., printing processing, will be completed.

[0054] In addition, if it is judged by the above S203 that there is no toner of the 1st development unit 231 (it is NO at S203), the existence of the toner in the 2nd development unit 232 will be distinguished (S211). And if a toner is in the 2nd development unit 232 and it will be distinguished (it is YES at S211), the rotation drive of the development rotary 22 will be carried out 180 degrees in order to perform development which used the 2nd development unit 232, and the 2nd development unit 232 will be moved to a development location (S206). And processing from S206 is performed like the above.

[0055] On the other hand, if it is judged by the above S211 that there is no toner of the 2nd development unit 232 (it is NO at S211), the message of the purport which shows that there is no toner to the 1st or 2nd development unit 231,232 will be displayed on the display (not shown) of image formation equipment 10 (S213), and printing processing will be ended after that.

[0056] Furthermore, if it is judged by the above S208 that there is no toner of the 2nd development unit 232 (it is NO at S208), the existence of the toner in the 1st development unit 231 will be distinguished (S212). And if a toner is in the 1st development unit 231 and it will be distinguished (it is YES at S212), the rotation drive of the development rotary 22 will be carried out 180 degrees in order to perform development which used the 1st development unit 231, and

the 1st development unit 231 will be moved to a development location (S201). And processing from S201 is performed like the above.

[0057] On the other hand, if it is judged by the above S212 that there is no toner of the 1st development unit 231 (it is NO at S212), the message of the purport which shows that there is no toner to the 1st or 2nd development unit 231,232 will be displayed on the display (not shown) of image formation equipment 10 (S213), and printing processing will be ended after that.

[0058] Therefore, the 1st development unit 231 and the 2nd development unit 232 with which the location which carries out phase opposite by CPU40 in the development unit 232 was equipped are identified, and it was made to control in the 2nd operation gestalt in order to have located each development unit 231,232 in a development location, respectively. Therefore, according to the amount of the toner used, they are used by the 1st development unit 231 and the 2nd development unit 232, switching, and the extensive and continuous monochrome development of them, i.e., monochrome printing, is attained until printing is completed.

[0059] Moreover, also in the 2nd operation gestalt, in addition to the effectiveness of (1) of the 1st operation gestalt, and (2), the development rotary 22 used for every amount of predetermined development is rotated 180 degrees, in order to change the development unit 231,232 used, homogeneity is mixed and the used electrification toner which exists in the feed roller 23c side by the rotation, and the intact toner in case 23a are refreshed. And if the development rotary 22 rotates 180 degrees again, the refreshed toner will be supplied to the feed roller 23c side, and development by the refreshed toner will be performed. Consequently, it is prevented that an electrostatic latent image is developed with the toner with which it is dotted with an electrification toner in large quantities, and it can prevent deterioration of the image quality acquired.

[0060] In addition, it changes as follows and this operation gestalt can also take shape.

- In the 1st operation gestalt, although nonvolatile memory 23e was made to memorize toner consumption and the development rotary 22 was rotated based on the toner consumption, a toner counter is formed, and if specified quantity consumption of the toner is carried out by the toner counter, the development rotary 22 may be rotated.

[0061] - The timing of a change may be changed into total printing time amount, the count of development, the number of printing dots, the period of a Vertical Synchronizing signal (VSYNC), etc. although the time of converting the amount of the toner used into the number of printing pages, and reaching the number of predetermined pages was set as the timing of a change of the development unit 23 with the 2nd operation gestalt.

[0062] - Although it made into the timing of a change whether for the amount of the toner used of the development unit 231,232 to have converted into developing negatives namely, printing to the record medium 32 of A4 size at the complement, and to have reached a part for 10 pages of continuation with the 2nd operation gestalt, the paper size of a record medium 32 may be changed into A3, A5, B4, B5, a postcard, etc., and the converted amount may be suitably changed with 20 pages of continuation, 30 pages, 40 etc. pages.

[0063] - In each operation gestalt, the development rotary 22 is constituted possible [wearing of the development unit 23 of five or more bodies], and while equipping with yellow, cyanogen, and the development unit 23 that held the toner of MAZENDA, you may equip with two or more development units 23 which held the toner of black. Thus, when constituted, the development and full color development by the toner of black are attained.

[0064] - Development of the monochrome which used only any one among the 1st - the 4th development units 231-234 in the 1st operation gestalt. The development of the monochrome which used the 1st and 2nd development unit 231,232, the development of the monochrome which used the 1st - the 3rd development units 231-233, The development of the monochrome which used the 2nd and 3rd development unit 232,233, the development of the monochrome which used the 1st - the 4th development units 231-234, Either of the development of the monochrome which used the monochromatic development and the monochromatic 3rd and 4th development unit 233,234 which used the 2nd - the 4th development units 232-234 may be performed.

[0065] - In the 2nd operation gestalt, the location which carries out phase opposite in the

development rotary 22 may be equipped with the development unit 231,232 of black, and another location which carries out phase opposite may be equipped with the development unit 233,234 of the same color of another color. Thus, when constituted, image formation equipment 10 becomes printable [two colors of the development of the monochrome by the toner of black, and the development of the monochrome by the toner of other colors].

[0066] - In the 2nd operation gestalt, development which used only the 1st or 2nd development unit 231,232 may be performed.

- In each operation gestalt, although the rotation drive of the development rotary 22 was enabled to the one direction, the development unit 231,232 which equips with the development unit 23 of the same color of at least two bodies the location which constitutes to forward reverse both directions possible [a rotation drive], for example, adjoins them, and is used based on a predetermined decision criterion between both the development units 231,232 may be changed.

[0067] - Although considered as monochrome printing with each operation gestalt by development which used the toner of black, the development rotary 22 is equipped with the development unit 23 which held yellow, cyanogen, or the toner of MAZENDA, and it is good also as yellow, cyanogen, or mono-color printing of MAZENDA.

[0068] - With the 1st operation gestalt, although the development rotary 22 was equipped with the development units 231-234 of four bodies, it may equip with the development unit 231,232 of two bodies, or the development unit 231,232,233 of three bodies, and negatives may be developed in order using them. In addition, the development rotary 22 may be equipped with the development unit 23 whose toner is not held at this time. Moreover, it may equip with the development unit 23 which held the toner of the same color of at least two bodies in the development rotary 22 which can equip with the development unit 23 of five or more bodies, and monochrome may be developed.

[0069] - In the 1st operation gestalt, the stirring member which stirs the toner in case 23a may be prepared. Thus, since the toner in case 23a is refreshed by the stirring member when constituted, it is prevented that an electrostatic latent image is developed with the toner with which it is dotted with an electrification toner in large quantities, and it can prevent deterioration of the quality of the image obtained.

[0070] - Although the 1st which makes the shape of isomorphism - the 4th development units 231-234 were used with each operation gestalt, the 1st from which a configuration differs - the 4th development units 231-234 may be used.

[0071] - Although the development units 231-234 of the same color in the development rotary 22 were identified with each operation gestalt based on the color information and positional information which were memorized by nonvolatile memory 23e as a storage means of the 1st - the 4th development units 231-234, nonvolatile memory 23e of each development units 231-234 may be omitted. And while forming in the 1st - the 4th development units 231-234 the color information which makes identifiable each development units 231-234, such as whenever [angle-of-reflection / of a projection and a reflective mirror], for every color, respectively and identifying the color information by CPU40, color information is related with the positional information in the development rotary 22, and the body memory 46 is made to memorize. And CPU40 may identify the development unit 23 of the same color based on the information memorized by the body memory 46, may control rotation of the development rotary 22, and monochrome may be developed.

[0072] - Although the identification information which includes color information in nonvolatile memory 23e of the 1st - the 4th development units 231-234 was made to memorize with each operation gestalt, the body memory 46 may be made to memorize identification information. And the identification information and positional information which were memorized by the body memory 46 may be associated, the development unit 23 of the same color may be identified, and monochrome may be developed.

[0073] - Although each development units 231-234 were identified with each operation gestalt based on the color information memorized by nonvolatile memory 23e, based on various information, such as residue information on a toner, quality information of a toner, and the date

of manufacture of a toner, each development units 231-234 other than color information may be identified.

[0074] - A photo conductor 17 may be arranged in the lower part location of the development rotary 22, and you may constitute so that negatives may be developed by the development unit 23 located just under the development rotary 22. Thus, when are constituted and the development unit 23 which equips with the development unit 23 the location which constitutes the development rotary 22 possible [a rotation drive] to forward reverse both directions, for example, adjoints, and is used between both the development units 23 is changed, stirring mixing of a toner is performed effectively and refresh of a toner is performed.

[0075] - Although the development rotary 22 was equipped with the development units 231-234 and development by the toner was performed to the photo conductor 17 of one body with each operation gestalt. Form the development unit 23 of one color to the photo conductor 17 of one body, and it considers as an image formation unit. The 1st - the 4th development units 231-234 go up and down to the tandem-type image formation equipment 10 or the photo conductor 17 of one body which prepared four image formation units. By each development units 231-234 Shape may be taken to elevator type image formation equipment 10 equipped with the image formation unit which develops negatives. And in the image formation equipment 10 of each format, at least two development units 23 which held the toner of the same color may be formed, and monochrome may be developed by development by the development unit 23 of at least two bodies.

[0076] - In the 1st operation gestalt, when the toner of the development unit 23 currently used is lost, the development rotary 22 may be rotated 180 degrees and negatives may be developed using the development unit 23 of the location which carries out phase opposite. Thus, when are constituted and the development unit 23 is changed, stirring mixing of a toner is performed effectively and refresh of a toner is performed.

[0077] - Although developing-roller 23b made negatives develop in slide contact with a photo conductor 17 with each operation gestalt, negatives may be made to develop according to a jumping format.

- Although shape was taken to ROM as a storage means with each operation gestalt, a storage means may be materialized to a bar code, a magnetic tape, etc.

[0078] - Although shape was taken to the color printer as image formation equipment 10 with the operation gestalt, shape may be taken in a mono-color printer and facsimile. Next, about the technical thought which can be grasped from the above-mentioned operation gestalt and example of another, a postscript is added to below with those effectiveness.

[0079] - Image formation equipment given in any 1 term of claim 3 characterized by having equipped with the development unit the location in said development unit supporter which carries out phase opposite, and constituting possible [a rotation drive of a development unit supporter] reversed [with a control means / a development unit] - claim 6. Thus, when are constituted and a development unit is changed, stirring mixing of a toner is performed effectively and refresh of a toner is performed.

[0080]

[Effect of the Invention] Since this invention is constituted as mentioned above, it does the following effectiveness so. According to image formation equipment according to claim 1, development by the monochromatic toner can be performed in large quantities, without carrying out the design change of a development unit and the development unit supporter, in case it is the development, time amount whose toner is lost can be made late and the count of exchange of a development unit can be reduced.

[0081] According to image formation equipment according to claim 2, in addition to an effect of the invention according to claim 1, a development unit is easily discriminable. According to image formation equipment according to claim 3, in addition to an effect of the invention according to claim 1 or 2, stirring mixing of a used electrification toner and the intact toner can be carried out, the whole toner can be refreshed, and deterioration of the image quality prevented and acquired [that an electrostatic latent image is developed with the toner with which an electrification toner inclines in large quantities, and it is dotted with it, and] can be prevented.

[0082] According to image formation equipment given in any 1 term of claim 4 - claim 6, in addition to an effect of the invention given in any 1 term of claim 1 - claim 3, the toner of a development unit is lost completely, and after it becomes clear that development became impossible, the time lag by changing a development unit is lost. Therefore, continuous development by the monochromatic toner can be performed.

[0083] According to the image formation approach according to claim 7, development by the monochromatic toner can be performed in large quantities, without carrying out the design change of a development unit and the development unit supporter, in case it is the development, time amount whose toner is lost can be made late and the count of exchange of a development unit can be reduced.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The schematic diagram showing the image formation equipment of an operation gestalt.

[Drawing 2] The sectional view showing the development rotary and development unit of an operation gestalt.

[Drawing 3] The block diagram showing the control unit of an operation gestalt.

[Drawing 4] The flow chart which shows development actuation of the 1st operation gestalt.

[Drawing 5] The flow chart which shows development actuation of the 2nd operation gestalt.

[Description of Notations]

10 Image Formation Equipment

17 Photo Conductor as Electrostatic Latent-Image Support

22 Development Rotary as a Development Unit Supporter

23 (231,232,233,234) Development unit

23e Nonvolatile memory as a storage means

40 CPU as Discernment Means and a Control Means

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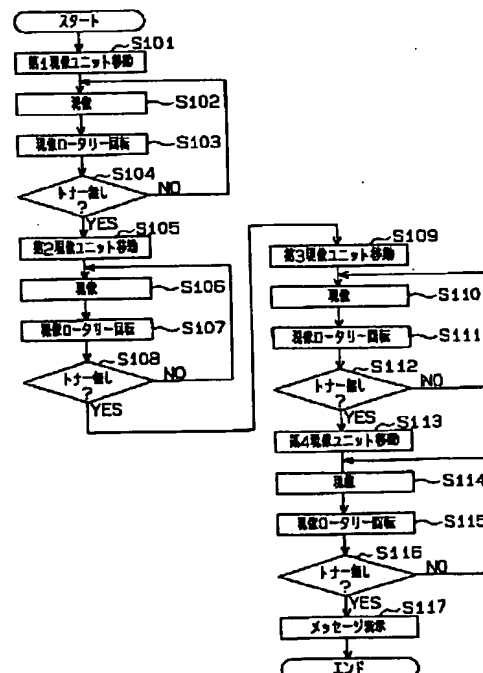
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(54) 【発明の名称】 画像形成装置及び画像形成方法

(57) 【要約】

【課題】 現像ユニット及び現像ユニット保持体を設計変更することなく単色のトナーによる現像を大量に行うことができ、その現像の際、トナーが無くなる時間を遅くして現像ユニットの取り替え回数を減らすことができる画像形成装置及び画像形成方法を提供する。

【解決手段】 現像ロータリーには4体の現像ユニットが装着され、全ての現像ユニットにはブラックのトナーが収容されている。そして、CPUによりトナーが無くなり次第、順次隣接する現像ユニットを現像位置に移動させた。



【0006】この発明は、このような従来技術に存在する問題点に着目してなされたものである。その目的とするところは、現像ユニット及び現像ユニット保持体を設計変更することなく単色のトナーによる現像を大量に行うことができ、その現像の際、トナーが無くなる時間を遅くして現像ユニットの取り替え回数を減らすことができる画像形成装置及び画像形成方法を提供することにある。

【0007】

【課題を解決するための手段】上記の目的を達成するために、請求項1に記載の発明の画像形成装置は、周面に静電潜像を担持する静電潜像担持体と、トナーを収容し、当該トナーにより前記静電潜像を現像する現像ユニットと、前記現像ユニットを複数保持可能な現像ユニット保持体と、前記現像ユニット保持体の動作を制御して、現像に使用される現像ユニットを複数の現像ユニットのなかから選択的に切り替える現像ユニット保持体の制御手段とを備える画像形成装置において、少なくとも現像ユニットに収容されたトナーの色情報を識別する識別手段を備え、現像ユニット保持体は、同色のトナーを収容した少なくとも2体の現像ユニットを保持可能であり、前記制御手段は前記識別手段に識別された色情報に基づいて同色の現像ユニットを識別し、同色のトナーを収容した少なくとも2体の現像ユニットを使用して単色の現像を行うべく現像ユニット保持体の動作を制御することを特徴とするものである。

【0008】請求項2に記載の発明の画像形成装置は、請求項1に記載の発明において、前記現像ユニットは色情報を記憶する記憶手段を備え、前記識別手段により前記色情報を識別することを特徴とするものである。

【0009】請求項3に記載の発明の画像形成装置は、請求項1又は請求項2に記載の発明において、前記現像ユニット保持体は、その回転駆動により現像に使用される現像ユニットを選択的に切り替える回転体であり、前記制御手段により当該現像ユニット保持体を回転駆動させて複数の現像ユニットのうちのいずれか1体を前記静電潜像担持体の対向する位置へ移動させることを特徴とするものである。

【0010】請求項4に記載の発明の画像形成装置は、請求項1～請求項3のいずれか一項に記載の発明において、前記制御手段により所定のタイミングで現像ユニット保持体の動作を制御し、単色のトナーによる現像中に当該現像に使用されていたトナーと同色のトナーを収容した別の現像ユニットに切り替えることを特徴とするものである。

【0011】請求項5に記載の発明の画像形成装置は、請求項4に記載の発明において、単色のトナーによる現像が連続する際は、前記所定のタイミングを、印字頁数が所定値に達したときに設定したことを特徴とするものである。

【0012】請求項6に記載の発明の画像形成装置は、請求項4に記載の発明において、前記現像ユニットはトナーの消費量を記憶する記憶手段を備え、前記所定のタイミングを前記トナーの消費量が所定値に達したときに設定したことを特徴とするものである。

【0013】請求項7に記載の発明の画像形成方法は、現像ユニット保持体に保持された複数の現像ユニットに収容されたトナーの色情報を識別手段により識別し、現像ユニット保持体の制御手段により現像に使用される現像ユニットを複数の現像ユニットのなかから選択的に切り替えて現像を行う画像形成装置による画像形成方法において、前記現像ユニットに収容されたトナーの色情報を識別手段により識別する工程と、前記色情報に基づいて同色の現像ユニットを識別し、同色のトナーを収容した少なくとも2体の現像ユニットを使用して単色の現像を行うべく制御手段により現像ユニット保持体の動作を制御する工程とよりなることを特徴とするものである。

【0014】

【発明の実施の形態】（第1実施形態）以下、本発明を画像形成装置（カラープリンタ）に具体化した第1実施形態を図面に従って説明する。図1は画像形成装置10内を模式的に示す概略図である。なお、この第1実施形態では4体の現像ユニット23（231～234）に収容されたブラックのトナーを使用した単色のトナーによる印字、即ちモノクロ印字に具体化して説明する。

【0015】まず、画像形成装置10内の概要について説明する。図1に示すように、画像形成装置10内には、周面に静電潜像を担持する静電潜像担持体としての感光体17と、トナーを収容し、当該トナーにより前記静電潜像を現像する現像ユニット23と、前記現像ユニット23を複数保持可能な現像ユニット保持体としての現像ロータリー22が設けられている。また、露光ユニット21、中間転写ユニット12、定着ユニット13、給紙装置16及び図3に示す画像形成装置10全体の制御を行う制御ユニット14が設けられている。

【0016】図1に示すように、前記感光体17はドラム状をなし、その感光体17の隣接位置には感光体17の外周面に摺接して外周面を一様に帯電させる帯電器19が設置されている。そして、感光体17の外周面が帯電器19により帯電された後、前記露光ユニット21によって所望の画像情報に応じた選択的な露光が感光体17の感光層（図示せず）になされると、その感光層には前記画像情報に応じた静電潜像が形成される。

【0017】前記現像ロータリー22は感光体17の隣接位置に回転駆動可能に配置され、4体の現像ユニット23（以下、本明細書では第1、第2、第3、第4現像ユニット231、232、233、234と称す）を保持可能に構成されている。また、現像ロータリー22には、保持される現像ユニット23の位置をそれぞれ識別可能な位置識別手段（図示せず）が設けられ、その位置

に、制御ユニット 14 はコントローラ部 38 とエンジン制御部 35 とから構成され、両者はインターフェイス線を通じて接続されている。前記コントローラ部 38 はホストコンピュータ 36 との通信を行い、パソコン（図示せず）のアプリケーションソフトウェア等により作製された画像情報等の各種情報がホストコンピュータ 36 からコントローラ部 38 へ送られるようになっている。前記コントローラ部 38 はホストコンピュータ 36 から送られてきた画像情報信号としてのレッド、グリーン、ブルーの RGB データをイエロー、マゼンダ、シアン、ブラックの画像データへと変換する機能を有する。さらに、画像データをコントローラ部 38 のメモリ（図示せず）に保存する機能を有する。なお、本実施形態においては、モノクロ印字を行うため、前記 RGB データはブラックの画像データに変換される。

【0029】前記エンジン制御部 35 は、識別手段及び制御手段としての CPU 40 を備え、その他に RAM 41、ROM 42、I/O 制御部 43、A/D コンバータ 44、D/A コンバータ 45、本体メモリ 46 等を備えている。前記 CPU 40 は画像形成装置 10 を構成する各部を制御するとともに、現像ユニット 231～234 におけるトナーの色情報及び消費量情報を識別する。そして、トナーの消費量が所定量に達したと判断すると、所定のタイミングで現像ロータリー 22 の回転駆動を制御する。また、トナーの使用量が所定サイズの記録媒体 32 に印字するのに必要な量に換算して所定頁分に達したと判断すると、現像ロータリー 22 の回転駆動を制御する。

【0030】また、CPU 40 は各現像ユニット 231～234 のうちのいずれかの現像側コネクタ 24 と前記制御側コネクタ 25 とが接続されたとき、不揮発性メモリ 23e と通信可能となり、不揮発性メモリ 23e の識別情報を読み込み可能又は不揮発性メモリ 23e に新たな識別情報を書き込み可能に構成されている。さらに、CPU 40 は前記識別情報と各現像ユニット 231～234 の現像ロータリー 22 における位置情報とを関連付けて、どの位置にどの色の現像ユニット 231～234 が装着されているかを識別するようになっている。

【0031】そして、CPU 40 は現像ロータリー 22 の現像ユニット 231～234 の位置と色を識別して、指定された色のトナーを収容した現像ユニット 231～234 を現像位置へ位置させるべく現像ロータリー 22 を回転させる制御を行う。特に、CPU 40 は、単色のトナーによる現像中に、所定のタイミングで当該現像に使用されていたトナーと同色のトナーを収容した別の現像ユニット 23 に切り替える制御を行う。

【0032】前記 RAM 41 は画像形成装置 10 に関する各種情報を一時的に記憶する。また、前記 ROM 42 は画像形成装置 10 を制御するための各種プログラムを記憶し、I/O 制御部 43 は入出力データを制御する。

前記 A/D コンバータ 44 は画像形成装置 10 におけるアナログ信号をデジタル信号に変換し、D/A コンバータ 45 はデジタル信号をアナログ信号に変換する。前記本体メモリ 46 は、前記現像ロータリー 22 における現像ユニット 231～234 の有無情報、不揮発性メモリ 23e に書き込まれたトナー色情報、トナー消費量情報等の各種識別情報及び位置情報を格納する。そして、識別情報と位置情報とにより現像ロータリー 22 のどの位置にどの色のトナーを収容した現像ユニット 231～234 が装着されているかが記憶されている。

【0033】次いで、上記構成の画像形成装置 10 によるモノクロ印字を行うために 4 体の現像ユニット 231～234（なお、第 1 現像ユニット 231、第 2 現像ユニット 232、第 3 現像ユニット 233、第 4 現像ユニット 234 とする）を使用して現像を行う動作を図 4 に示すフローチャートを使用して説明する。なお、この動作は ROM 42 に記憶されたプログラムに基づき、CPU 40 の制御により実行される。また、各現像ユニット 231～234 の不揮発性メモリ 23e にはそれぞれブラックのトナーが収容されている旨の識別情報が格納されている。

【0034】そして、現像動作の前に各現像ユニット 231～234 と CPU 40 とが通信されて、本体メモリ 46 には 4 体の現像ユニット 231～234 の有無情報及び各現像ユニット 231～234 の識別情報が格納されているとともに、どの位置にどの現像ユニット 231～234 が装着されているかが記憶されている。

【0035】さて、ホストコンピュータ 36 からの印字指令信号（画像情報信号）がコントローラ部 38 でブラックの画像データに変換された後、コントローラ部 38 のメモリに保存され、所定量の画像データの変換が終了すると、エンジン制御部 35 に現像開始を要求する旨の情報が送信される。すると、帯電器 19 及び露光ユニット 21 により静電潜像が形成される。

【0036】続けて、現像ロータリー 22 が回転駆動され、第 1 現像ユニット 231 が現像位置へ移動される（ステップ 101（以下、単に S101 と称す））。次いで、第 1 現像ユニット 231 内のトナーを使用して前記静電潜像の現像が行われる（S102）。次に、第 1 現像ユニット 231 内におけるトナーの消費量が、ケース 23a の仕切板 23d より供給ローラ 23c 側に収容可能なトナー量に達したと判断される。すると、現像ロータリー 22 の 360 度の回転駆動が制御され（S103）、第 1 現像ユニット 231 内のトナーの攪拌が行われるとともに、ケース 23a 内奥に存在するトナーが供給ローラ 23c 側に供給される。

【0037】そして、現像ロータリー 22 の回転後、第 1 現像ユニット 231 内のトナーの消費量が読み込まれ、トナーの有無が判別される（S104）。トナー消費量が第 1 現像ユニット 231 内に収容されていたトナ

ーの使用量がA4サイズの記録媒体32に印字するのに必要な量に換算して連続10頁分に達したか否かに設定されている。

【0047】そして、第2実施形態においては、上記構成の画像形成装置10によるモノクロ印字を第1～第4現像ユニット231～234のうち相対向する位置に装着された2体の第1及び第2現像ユニット231、232を使用して現像をして行う動作を図5に示すフローチャートを使用して説明する。即ち、現像ロータリー22の相対向する位置に装着された第1及び第2現像ユニット231、232をCPU40により識別し、両現像ユニット231、232がそれぞれ現像位置に位置するように現像ロータリー22の回転を制御させる。また、第1及び第2現像ユニット231、232の不揮発性メモリ23eにはそれぞれブラックのトナーが収容されている旨の識別情報が格納され、本体メモリ46には2体の現像ユニット231、232の有情報及び各現像ユニット231、232の識別情報が格納されている。

【0048】さて、ホストコンピュータ36からの印字指令信号(画像情報信号)がコントローラ部38でブラックの画像データに変換され、所定の処理が行われた後、エンジン制御部35に現像開始を要求する旨の情報が送信される。すると、帯電器19及び露光ユニット21により静電潜像が形成される。

【0049】続けて、現像ロータリー22が回転駆動され、第1現像ユニット231が現像位置へ移動される(S201)。次いで、印字の有無が判別される(S202)。印字が有ると判別されると(S202でYES)、第1現像ユニット231内のトナーの有無が判別される(S203、なお、図5では第1トナー有り?と示す)。一方、印字が無しと判別されると(S202でNO)、印字処理が終了される。

【0050】そして、前記S203において、第1現像ユニット231内にトナーが有ると判別されると(S203でYES)、第1現像ユニット231のトナーを使用して現像が行われる(S204)。続いて、第1現像ユニット231のトナーの使用量が前記判断基準に基づいて判断される(S205)。第1現像ユニット231のトナー使用量が連続10頁分に達していないと判断されると(S205でNO)、前記S202に戻り、印字残りの有無が判別される(S202)。印字残りが無しと判別されると(S202でNO)、現像処理、即ち印字処理が終了される。印字残りが有りと判別されると(S202でYES)、上記と同様の処理が再度行われる。

【0051】さて、前記S205において、第1現像ユニット231のトナー使用量が連続10頁分に達したと判断されると(S205でYES)、現像ロータリー22が180度回転駆動されて、第2現像ユニット232が現像位置へ移動される(S206)。次いで、印字の

有無が判別される(S207)。印字が有ると判別されると(S207でYES)、第2現像ユニット232内のトナーの有無が判別される(S208、なお、図5では第2トナー有り?と示す)。一方、印字が無しと判別されると(S207でNO)、印字処理が終了される。

【0052】そして、前記S208において、第2現像ユニット232内にトナーが有ると判別されると(S208でYES)、第2現像ユニット232のトナーを使用して現像が行われる(S209)。続いて、第2現像ユニット232のトナーの使用量が前記判断基準に基づいて判断される(S210)。第2現像ユニット232のトナー使用量が連続10頁分に達していないと判断されると(S210でNO)、前記S207に戻り、印字残りの有無が判別される(S207)。印字残りが無しと判別されると(S207でNO)、印字処理が終了される。印字残りが有りと判別されると(S207でYES)、上記と同様の処理が再度行われる。

【0053】さて、前記S210において、第2現像ユニット232のトナー使用量が連続10頁分に達したと判断されると(S210でYES)、現像ロータリー22が180度回転駆動されて、第1現像ユニット231が現像位置へ移動される(S201)。そして、上記と同様にS201からの処理が再度行われ、印字残りがなくなるまで第1現像ユニット231と第2現像ユニット232との切換が行われながら現像が行われ、印字が無くなると現像処理、即ち印字処理が終了する。

【0054】なお、上記S203で第1現像ユニット231のトナーが無いと判断されると(S203でNO)、第2現像ユニット232内のトナーの有無が判別される(S211)。そして、第2現像ユニット232内にトナーが有ると判別されると(S211でYES)、第2現像ユニット232を使用した現像を行うべく現像ロータリー22が180度回転駆動されて、第2現像ユニット232が現像位置へ移動される(S206)。そして、上記と同様にS206からの処理が行われる。

【0055】一方、上記S211で第2現像ユニット232のトナーが無いと判断されると(S211でNO)、画像形成装置10の表示部(図示せず)に第1又は第2現像ユニット231、232にトナーが無いことを示す旨のメッセージが表示され(S213)、その後、印字処理が終了される。

【0056】さらに、上記S208で第2現像ユニット232のトナーが無いと判断されると(S208でNO)、第1現像ユニット231内のトナーの有無が判別される(S212)。そして、第1現像ユニット231内にトナーが有ると判別されると(S212でYES)、第1現像ユニット231を使用した現像を行うべく現像ロータリー22が180度回転駆動されて、第1現像ユニット231が現像位置へ移動される(S201)。そして、上記と同様にS201からの処理が行わ

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うに構成した場合、攪拌部材によりケース 23a 内のトナーがリフレッシュされるため、帯電トナーが大量に点在するトナーによって静電潜像が現像されるのが防止され、得られる画像の品質の低下を防止することができる。

【0070】・ 各実施形態では、同形状をなす第 1～第 4 現像ユニット 231～234 を使用したが、形状が異なる第 1～第 4 現像ユニット 231～234 を使用してもよい。

【0071】・ 各実施形態では、第 1～第 4 現像ユニット 231～234 の記憶手段としての不揮発性メモリ 23e に記憶された色情報と位置情報に基づいて、現像ロータリー 22 における同色の現像ユニット 231～234 を識別したが、各現像ユニット 231～234 の不揮発性メモリ 23e を省略してもよい。そして、第 1～第 4 現像ユニット 231～234 にそれぞれ突起、反射ミラーの反射角度等の各現像ユニット 231～234 を色毎に識別可能とする色情報を形成し、その色情報を CPU 40 により識別するとともに、色情報を現像ロータリー 22 における位置情報に関連付けて本体メモリ 46 に記憶させる。そして、CPU 40 が本体メモリ 46 に記憶された情報に基づいて同色の現像ユニット 23 を識別して現像ロータリー 22 の回転を制御して単色の現像を行ってもよい。

【0072】・ 各実施形態では、第 1～第 4 現像ユニット 231～234 の不揮発性メモリ 23e に色情報を含む識別情報を記憶させたが、識別情報を本体メモリ 46 に記憶させてもよい。そして、本体メモリ 46 に記憶された識別情報と位置情報に関連付けて同色の現像ユニット 23 を識別して単色の現像を行ってもよい。

【0073】・ 各実施形態では、不揮発性メモリ 23e に記憶された色情報に基づいて各現像ユニット 231～234 を識別したが、色情報の他にトナーの残量情報、トナーの品質情報、トナーの製造年月日等の各種情報に基づいて各現像ユニット 231～234 を識別してもよい。

【0074】・ 感光体 17 を現像ロータリー 22 の下方位置に配置し、その現像ロータリー 22 の真下に位置する現像ユニット 23 により現像を行うように構成してもよい。このように構成した場合、現像ロータリー 22 を正逆両方向へ回転駆動可能に構成し、例えば、隣接する位置に現像ユニット 23 を装着して両現像ユニット 23 の間で使用する現像ユニット 23 を切り替えたとき、トナーの攪拌混合が効果的に行われ、トナーのリフレッシュが行われる。

【0075】・ 各実施形態では、1 体の感光体 17 に対して、現像ロータリー 22 に現像ユニット 231～234 を装着してトナーによる現像を行ったが、1 体の感光体 17 に対して 1 色の現像ユニット 23 を設けて画像形成ユニットとし、画像形成ユニットを 4 体設けたタン

DEM式画像形成装置 10 又は 1 体の感光体 17 に対して第 1～第 4 現像ユニット 231～234 が昇降して各現像ユニット 231～234 により現像を行う画像形成ユニットを備えたエレベータ式画像形成装置 10 に具体化してもよい。そして、各形式の画像形成装置 10 において、同色のトナーを収容した現像ユニット 23 を少なくとも 2 体設けて、その少なくとも 2 体の現像ユニット 23 による現像によって単色の現像を行ってもよい。

【0076】・ 第 1 実施形態において、使用している現像ユニット 23 のトナーが無くなった場合、現像ロータリー 22 を 180 度回転させて、相対向する位置の現像ユニット 23 を使用して現像してもよい。このように構成した場合、現像ユニット 23 を切り替えたとき、トナーの攪拌混合が効果的に行われ、トナーのリフレッシュが行われる。

【0077】・ 各実施形態では感光体 17 に現像ローラ 23b が摺接して現像を行わせたが、ジャンピング形式により現像を行わせてもよい。

・ 各実施形態では記憶手段として ROM に具体化したのが、記憶手段をバーコード、磁気テープ等に具体化してもよい。

【0078】・ 実施形態では画像形成装置 10 としてカラープリンタに具体化したのが、モノカラープリンタ、ファクシミリに具体化してもよい。次に上記実施形態及び別例から把握できる技術的思想について、それらの効果とともに以下に追記する。

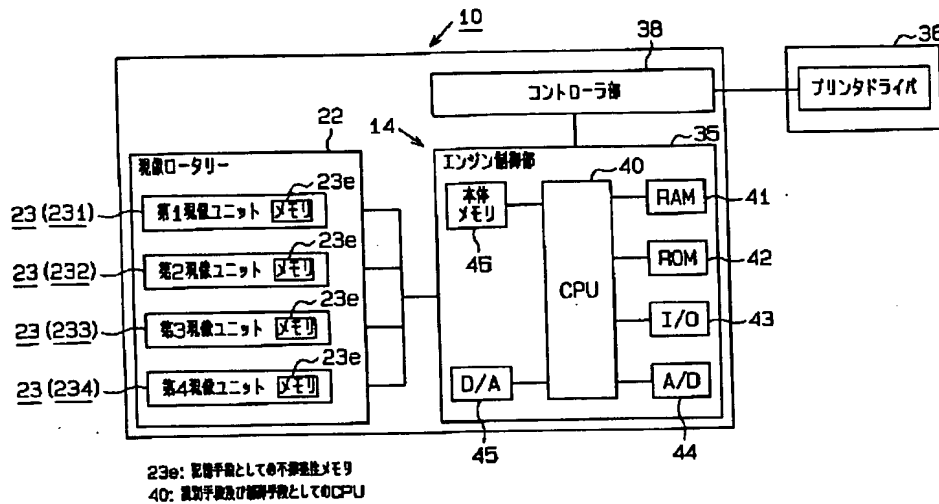
【0079】・ 前記現像ユニット保持体における相対向する位置に現像ユニットを装着して、制御手段により、現像ユニットが反転すべく現像ユニット保持体を回転駆動可能に構成したことを特徴とする請求項 3～請求項 6 のいずれか一項に記載の画像形成装置。このように構成した場合、現像ユニットを切り替えたとき、トナーの攪拌混合が効果的に行われ、トナーのリフレッシュが行われる。

【0080】

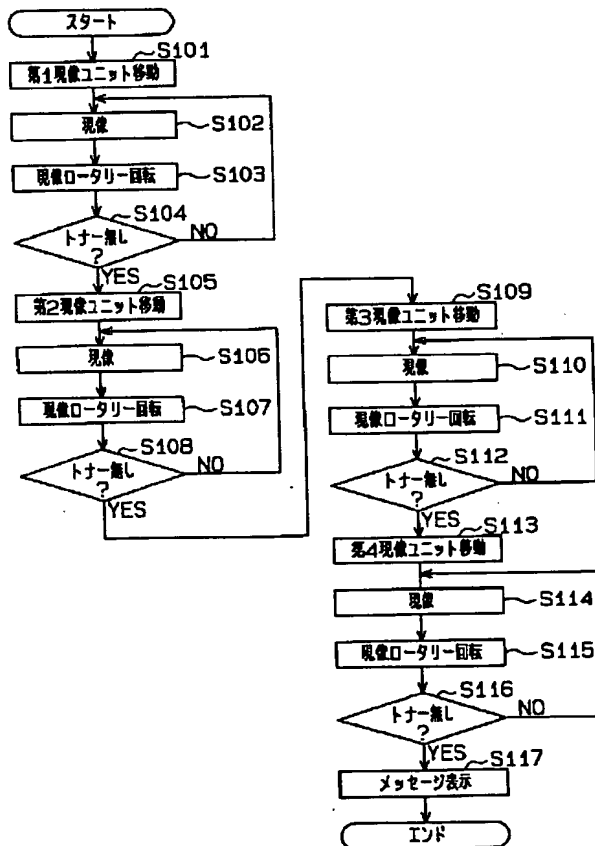
【発明の効果】この発明は、以上のように構成されているため、次のような効果を奏する。請求項 1 に記載の画像形成装置によれば、現像ユニット及び現像ユニット保持体を設計変更することなく単色のトナーによる現像を大量に行うことができ、その現像の際、トナーが無くなる時間を遅くして現像ユニットの取り替え回数を減らすことができる。

【0081】請求項 2 に記載の画像形成装置によれば、請求項 1 に記載の発明の効果に加え、現像ユニットの識別を容易に行うことができる。請求項 3 に記載の画像形成装置によれば、請求項 1 又は請求項 2 に記載の発明の効果に加え、使用済みの帯電トナーと、未使用のトナーとを攪拌混合してトナー全体をリフレッシュすることができ、帯電トナーが大量に偏って点在するトナーにより静電潜像が現像されるのを防止して得られる画像品質の

【図 3】



【図 4】



【図 5】

